

COMPOSITIONS FOR MOLTEN SALT PROPERTIES MEASUREMENTS

Nuclear Technology R & D

***Prepared for
U.S. Department of Energy
Molten Salt Reactor Campaign
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November 22, 2019
ANL/CFCT-19/26***



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ACKNOWLEDGEMENTS

This report was produced under the auspices of the US DOE Office of Nuclear Energy's Nuclear Technology Research and Development Molten Salt Reactor Campaign under the direction of Dr. Lou Qualls, National Technical Director, and Mr. Brian Robinson, DOE Federal Manager. Issuance of this report meets milestone M4AT-20AN040601082.

This work was conducted at Argonne National Laboratory and supported by the U.S. Department of Energy, Office of Nuclear Energy, under Contract DE-AC02-06CH11357.

Compositions for Molten Salt Properties Measurements

Work in FY20 at ANL will determine the precision of the methods being used to measure salt property values and establish standard procedures and expected data quality. This will be done by making new property measurements for several MSR-relevant salts that have been characterized previously to assess both within-laboratory and between-laboratory precisions for key property measurements. Properties to be measured include melting temperature, heat capacity, viscosity, density and thermal diffusivity.

Property measurements will be made for two representative coolant salts, a chloride-based fuel bearing salt, and a fluoride-based fuel bearing salt. The two coolant salts to be evaluated are eutectic mixtures of 46.5 LiF-11.5 NaF- 42.0 KF (mol %) and 66 LiF-34 BeF₂ (mol %). Values for several properties of these salts have been published and both are currently being studied at Oak Ridge National Laboratory, Canadian Nuclear Laboratory, KAIROS Power and Brigham Young University. Properties of the 66 NaCl- 34 UCl₃ (mol %) and 78.5 NaF-21.5 UF₄ (mol %) eutectic mixtures will be measured to represent those of chloride and fluoride-based fuel bearing salts. The NaCl-UCl₃ mixture is currently being studied at LANL and Washington State University, and at least one MSR developer proposed using this salt formulation. The combination of new property measurements made at ANL and values measured at other laboratories by using the same or other methods will be used to assess the precision of the measured values.

The results for these salt systems will be used to support industry development of MSR's, establish standard procedures and determine expected data quality for molten salt property measurements to be made in the future. These analyses will also provide insights for evaluating the quality of data currently available.